

A broader discussion on sustainability: Four Specific Observations

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Thought 1:
**The Heaviest trucks have a sensible
alternative to Electric and Hydrogen**

It's Bio-Fuels!!

**In a diesel tank, a 40% tank of bio-fuel = a 40%
reduction in CO2
(the 2030 target)**

This could be done well before 2030 !!



Scania's bio-ethanol truck Is available now



There are many potential Bio-Fuels for consideration!!

Thought 2:
**The not discussed greenhouse bi-product of
Hydrogen**

Hydrogen fuel does not emit Carbon.....

Great it's winner for our 2030 and 2050 carbon Greenhouse targets

BUT

**Burning hydrogen produces Water vapour (good old H₂O – So what's
the problem?)**



Water Vapour is a very powerful greenhouse gas !

Why is this fact barely mentioned?

**Maybe it's a hard sell to convince people water vapour is a
powerful greenhouse gas (don't boil the jug)**

- **Water vapour makes clouds!**
- **Clouds can block surface heat , thus warming the earth**



Hydrogen is saved by its infancy !

If all the world's energy was produced by hydrogen tomorrow

**we would have a lot more clouds and a massive increase in
cloud cover**

This would lead to a instant increase in the Greenhouse effect.



Thought 3:

High Productivity Vehicles (Trucks)

the

Performance Based Standards Framework



The PBS concept and framework

**First proposed by the National Road
Transport Commission in 1999**

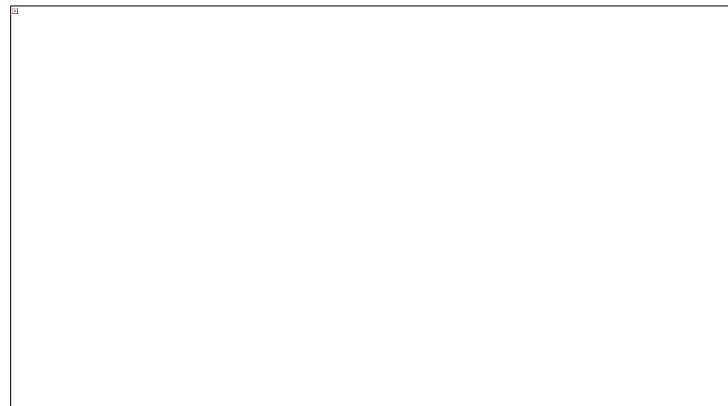
Agreed by ministers in 2006 and the

**Implementation was handed to the new
National Heavy Vehicle Regulator in 2013**

Since then the growth has been massive !!!!

The improved PBS Truck Engineering Standards

1. Startability	7. Frontal Swing	13. High Speed Transient Off tracking
2. Gradability	8. Tail swing	14. Pavement Vertical loading
3. Acceleration	9. Steer tyre friction	15. Pavement Horizontal loading
4. Overtaking	10. Static Rollover	16. Tyre contact area
5. Tracking ability	11. Rearward amplification	17. Bridge loading.
6. Low speed off tracking	12. Yaw Damping	



PBS Vehicle Savings - Numbers :

Year	PBS Numbers	Conventional Truck numbers if no PBS	Vehicle Savings
2008	73	89	16
2009	148	181	33
2010	408	500	92
2011	736	901	165
2012	1192	1460	268
2013	1827	2365	538
2014	2771	3588	817
2015	3692	4780	1088
2016	5092	6593	1501
2017	6497	8412	1915
2018	8253	10685	2432
2019	10004	12952	2948
2020	11638	15068	3430
2021	13756	17810	4054
2022	16075	20812	4737
Per 1000 PBS Vehicles		Savings	296 (29.6%)



Forecast Fuel savings through PBS Adoption

Year	PBS truck numbers	Saving/year Mill litres	Cumulative Mill litres
2034	46406	857	8259
2033	43370	801	7402
2032	40157	741	6601
2031	37183	686	5860
2030	34428	636	5174
2029	31878	588	4538
2028	29381	542	3950
2027	27079	500	3407
2026	24958	461	2907
2025	22689	419	2447
2024	20440	377	2028
<u>2023</u>	<u>18169</u>	<u>335</u>	<u>1651</u>
2022	16075	297	1315
2021	13745	254	1018
2020	11630	215	765
2019	9949	184	550
2018	8253	152	366
2017	6497	120	214



Thought 4: Thorium Nuclear

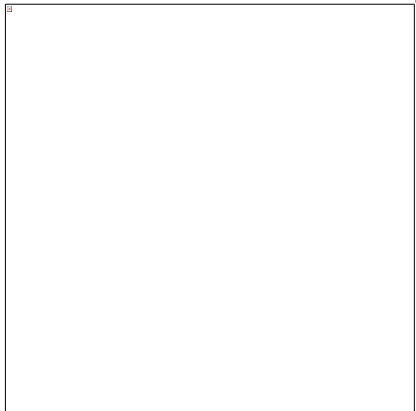
The Green Recyclable nuclear

The best kept secret:

The re-emerging nuclear alternative

The USA's reactor operated at Oak Ridge Labs

1965-69

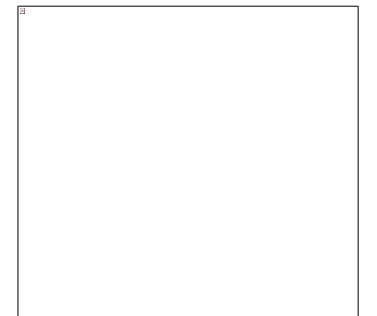
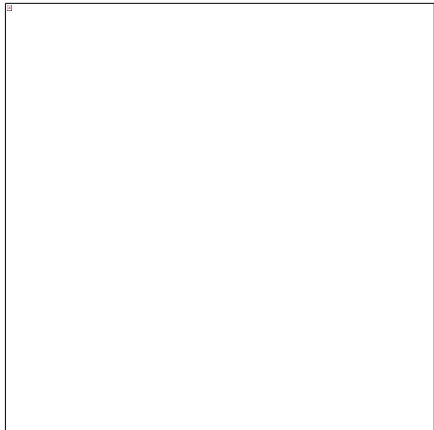


Thought 4: Thorium Nuclear

The USA defunded thorium research in 1973, (you can't make bombs out of it) and then

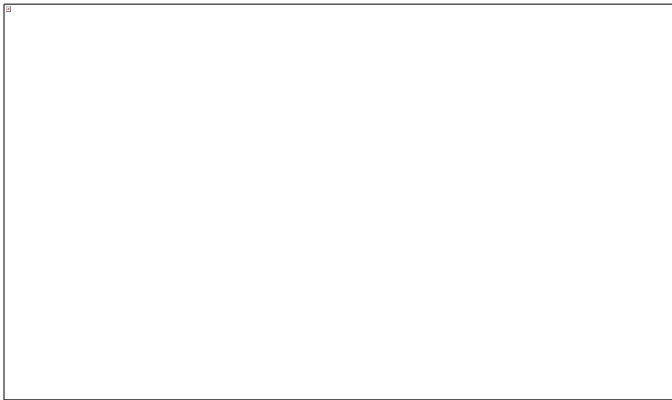
They never licensed an application thereafter

up until.....



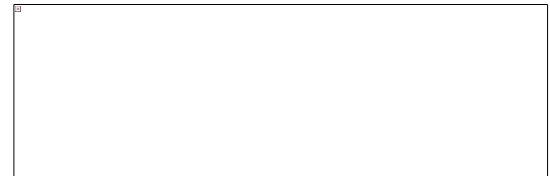
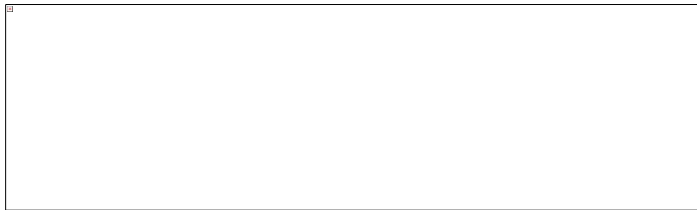
Thought 4: Thorium Nuclear

- China began building a 60MW Thorium molten Salt reactor in June 2023, due for completion in 2029.
- The USA then passed the 'Thorium Energy Security Act in 2022' and licensed Abilene University (ACU) to establish a research Thorium reactor, targeting criticality by 2025....



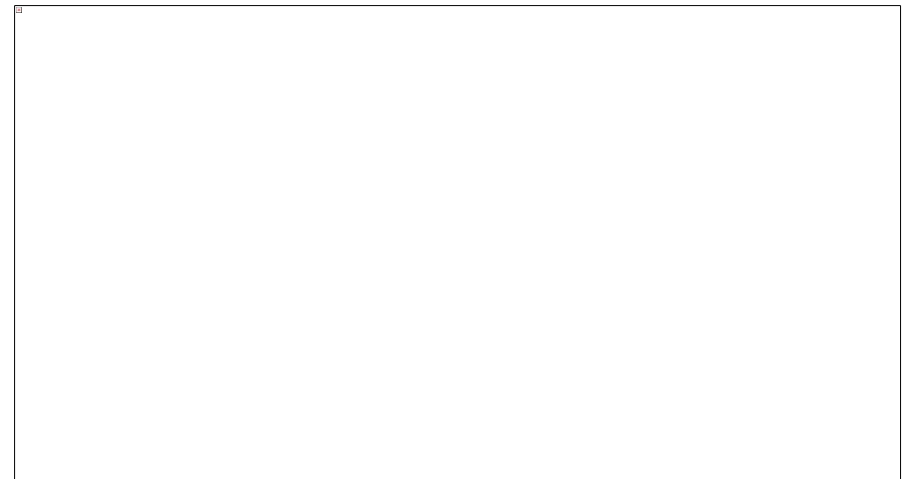
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- Canada is constructing a CANDU Thorium reactor , and
- Germany has commissioned two companies **Thorizon and Naarea** to produce modular Thorium Reactors by 2030



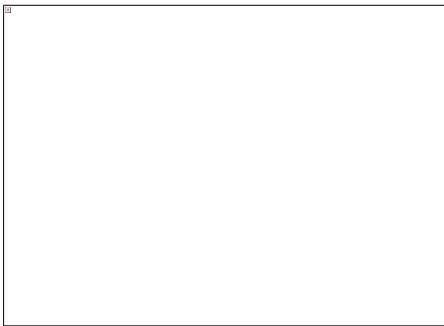
Thought 4: Thorium Nuclear

- Copenhagen Atomics (A startup team requiring updated Thorium regulation)
- <https://www.copenhagenatomics.com/>
- The New ONION reactor



Thought 4: Thorium Nuclear

- Don't put Thorium nuclear in the same camp as Uranium nuclear !!! (Often the anti nuclear camp does not recognize the distinction)
- Thorium reactors don't melt down, and thorium waste can be recycled in a very short time. (Benefits)
- **If all energy options are on the table why has Thorium not been mentioned?**



Questions ??

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